AMENDMENTS TO THE SPECIFICATION:

Page 1, please add the following new paragraphs before paragraph [0001]:

[0000.2] CROSS-REFERENCE TO RELATED APPLICATIONS

[0000.4] This application is a 35 USC 371 application of PCT/DE 2004/001228 filed on June 15, 2004.

[0000.6] BACKGROUND OF THE INVENTION

Please replace paragraph [0001] with the following amended paragraph:

[0001] ~~Technical Art~~ **Field of the Invention**

Please add the following new paragraph after paragraph [0001]:

[0001.2] This invention relates to throttle valves for internal combustion engines, and more particularly to an improved process for producing such throttle valves.

Please add the following new paragraph after paragraph [0001.2]:

[0001.4] Description of the Prior Art

Please delete paragraph [0003].

Please replace paragraph [0004] with the following amended paragraph:

[0004] EP 0 482 272 A1 ~~relates to a valve unit. It~~ discloses a valve device and a method for manufacturing a moving valve flap in a housing that accommodates the moving valve flap. The valve flap and valve housing are manufactured in ~~one and~~ the same mold. The housing is manufactured in a first injection molding step and the disk-shaped valve flap is molded inside it in a subsequent injection molding step. On the valve flap that moves in relation to the housing, sealing sections are provided, which cooperate in a sealing fashion with housing regions of the valve housing. The valve flap is preferably of the butterfly type and the valve

housing is preferably of the type designed to accommodate a butterfly type valve flap. The disclosed manufacturing method is capable of significantly reducing the cost of producing a valve device for the automotive field. In this embodiment variant, the valve flap and its housing are positioned transversely in relation to the air flow direction.

Page 2, please replace paragraph [0005] with the following amended paragraph:

[0005] US 5,304,336 likewise relates to a method for manufacturing a **valve** device[[.]] ~~The device contains~~ **containing** a moving part and a housing for accommodating the moving part. The moving part and the housing are produced in sequential manufacturing steps of an injection molding process. Preferably, the housing is injection molded in a first process step and the part that moves in relation to the housing is produced in another manufacturing step in which this moving part is situated in an at least partially closed position. According to the disclosed manufacturing method, a surface of the housing serves as at least a portion of a mold for forming a sealing portion of the movable valve flap, thus achieving a very close tolerance between the housing and the valve flap that moves in relation to it. Also according to US 5,304,336, the valve flap that moves in relation to the housing is embodied as butterfly-shaped. The housing is preferably of the type that accommodates a butterfly type valve flap.

Page 5, please replace paragraph [0011] with the following amended paragraph:

[0011] The intermediate treatment of the premolded housing part between the first injection molding step and the second injection molding step reduces the subsequent tendency of the housing part (premolded part) to warp during operation. After the premolded part is

demolded from the cavity of the first injection molding step, then it can be immediately subjected to a high temperature level, which temperature level lies above the glass temperature of the plastic material used in the first injection molding step. At the high temperature level during the intermediate treatment, the stresses induced by molecular orientations during the filling process of the cavities or by delayed crystallization effects during the rapid cooling process of the premolded part taper off during the time that the premolded part spends, for example, inside [[a]] **an annealing chamber or** warming cabinet. Without the intermediate treatment, after the end of the first injection molding step, the molecular orientations or the delayed crystallization effects would, over months and years, lead to recovery deformations of the housing part injection molded in the first injection molding step. Over the operating time of a throttle valve unit, this leads to a change in the gap dimension and therefore to impairment of the function to the point of a possible jamming or seizing of the valve flap part that is situated in a moving fashion inside a gas passage of the housing part.

Page 6, please replace paragraph [0012] with the following amended paragraph:

[0012] Due to the intermediate treatment of the premolded housing part – and consequently before its insertion into the second cavity during the second injection molding step – the housing part is brought into a state of extremely low internal stresses and high dimensional reproducibility. At the same time, the intermediate treatment serves as a buffer step to regulate the state of the premolded housing part with regard to the part temperature and the stress state inside the housing part before its insertion into the second cavity in a second

molding station of an injection mold or injection molds that are used in series. This makes it possible to circumvent potential interruptions in production that result in irregularities in the production flow and therefore to quality losses, rejection of premolded parts, and restarting losses. This means it is also possible to circumvent production interruptions by having the housing part remain in an oven until production interruptions have been eliminated and the production process can then continue. In addition to a heat treatment of the premolded housing part ~~(premolded part)~~ in a warming cabinet, it is also possible to couple mechanically or electromagnetically produced oscillations into the premolded housing part. The stresses induced in the premolded housing part by polymer chain orientation during the filling process of the cavities or by delayed crystallization effects can also be reduced down to a residual stress level that is noncritical for the subsequent process by subjecting the premolded housing part to black infrared radiation. The intermediate treatment step to which the premolded part obtained from the first injection molding station is subjected can, generally speaking, be characterized by a light and heat treatment of the premolded housing part (premolded part).

Page 7, please replace paragraph [0014] with the following amended paragraph:

[0014] In order to further reduce frictional resistances and wear of the bearing points between the housing part and the valve flap part, it is also possible to insert bushes made of a third material. The slide bushes or bearing bushes can be inserted into the premolded housing part in such a way as to prevent them from rotating in relation to it so that the flap shaft parts molded onto the preferably dome-shaped valve flap part are able to rotate in relation to the valve flap part or are inserted into the premolded housing part ~~(premolded part)~~ so that the

bushes can rotate in relation to the premolded housing part; the flap shaft parts of the preferably dome-shaped valve flap part are then injection molded into the slide bushes or bearing bushes that are inserted into the wall of the premolded housing part. Both of these embodiment variants are possible with the method proposed according to the present invention. The bearing bushes are preferably made of a wear-resistant metallic or nonmetallic bearing material.

Page 9, please replace paragraph [0017] with the following amended paragraph:

[0017] Drawings **BRIEF DESCRIPTION OF THE DRAWINGS**

Please replace paragraph [0018] with the following amended paragraph:

[0018] The present invention will be described in detail below in conjunction with the drawings[[.]] **, in which:**

Page 10, please replace paragraph [0026] with the following amended paragraph:

[0026] Fig. 9 shows bearing bushes inserted into the premolded part after removal from the first injection molding station, **and**

Please replace paragraph [0028] with the following amended paragraph:

[0028] ~~Embodiment Variants~~

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Please delete paragraph [0029].

Please replace paragraph [0030] with the following amended paragraph:

[0030] **Fig. 1 shows a premolded** housing part made of a first plastic material. [[A]] housing part 10 of a throttle valve unit used in the intake line of an internal combustion engine**, which part** is ~~injection molded as an~~ injection molded component made of a first plastic material. The first plastic material can be selected from among partially crystalline thermoplastics and amorphous high-temperature thermoplastics that have high melting temperatures and high crystallization gradients as well as excellent resistances to heat distortion, oil, and fuel. The amorphous high-temperature thermoplastics that can be used have a very high glass temperature that is at least 30 K above the continuous use temperature of the throttle valve unit. The above-mentioned materials also have low coefficients of friction and low wear rates. The housing part 10 has a flange 11 on which flange attachments 12 are provided in accordance with the available installation space. The housing part 10 delimits a gas passage 13 and is embodied with a wall thickness 16. The wall of the gas passage 13 contains opposing openings 14 to accommodate a valve flap part 17 that will be molded into place in another process step. The housing part 10 is produced as a premolded part in a first injection molding station. Injection points via which the first plastic material is conveyed into the first injection molding station are labeled with the reference numeral 15. Although only two injection points 15 are depicted in Fig. 1, it is possible to provide a number of injection points 15, for example up to 8 of them, via which the first plastic material is conveyed into the first cavity.

Page 11, please delete paragraph [0031].

Page 12, please replace paragraph [0033] with the following amended paragraph:

[0033] The second plastic material, which is injected into the premolded housing part ~~(premolded part)~~ and constitutes the preferably domed valve flat part 17, can either be a partially crystalline thermoplastic or amorphous high-temperature thermoplastic with a melting temperature that is lower than the melting temperature of the first plastic material of the premolded housing part or, if care is taken to respect process engineering parameters, then it is possible to use a partially crystalline thermoplastic or an amorphous high-temperature thermoplastic with a melting temperature that is higher than the melting temperature of the first plastic material of the premolded housing part.

Please delete paragraph [0034].

Please replace paragraph [0035] with the following amended paragraph:

[0035] ~~The valve flap part 17 in the perspective view in Fig. 3 is provided with a ribbing 21 on its back.~~ **Fig. 3 shows a rear view of the valve flap part from Fig. 2, with a ribbing 21 on the rear flap surface oriented away from the side struck by the flow.** The ribbing 21 extends approximately in the shape of a star on the back of the flap surface 18, leading out from an injection point 24 via which the second plastic material is injected into a second cavity of a second injection molding station. The first flap shaft part 19 extends from the flap surface 18 of the valve flap 17 and the elongated second flap shaft part 20 extends from the drive side of the valve flap part 17. Fig. 3 clearly shows the back of the sealing edge 23 extending around the circumference of the flap surface 18. In order to achieve the required mechanical strength, is also possible to provide reinforcing ribs in the circumference direction (for example in an elliptical or rounded form).

Page 13, please replace paragraph [0037] with the following amended paragraph:

[0037] The second injection molding station 40 ~~shown in Fig. 4~~ contains a premolded part 41 embodied in the form of a housing part 10 of a throttle valve unit. To execute the second injection molding step inside the second injection molding station 40, the premolded part 41 is removed from a first cavity of a first injection molding station. After the premolded part 41 is injection molded out of a first plastic material, the premolded part 41 in an injection molding device can be conveyed to the second injection molding station 40 by being moved manually, or through actuation of a turntable that transports the premolded part 41, actuation of an index plate, or actuation of a manipulation system. In the second injection molding station 40, a second cavity 42 is provided to form the valve flap part 17 that is to be integrated into the premolded part 41. During the reverse injection molding of the valve flap part 17 in the second injection molding station 40, the geometry of essential molding regions on the premolded part 41 can be used to elastically deform or prestress the premolded part 41 in the second injection molding step inside the second injection molding station 40 by changing the outer geometry of the surrounding mold parts of the second cavity 42 in relation to the first cavity. This offers the possibility of using mold engineering to influence a subsequent gap formation between the sealing edge 23 of the valve flap part 17 and the bearing points in the premolded part 41.

Page 14, please replace paragraph [0038] with the following amended paragraph:

[0038] By using the method proposed according to the present invention, the sealing edge 23 of the valve flap part 17 can on the one hand be embodied so that in the finished injection

molded part, the valve flap part 17 contactlessly passes through the gas passage 13 in the premolded housing part 10 ~~(premolded part)~~. When a valve flap part 17 is embodied so that it passes through, the sealing edge 23 on the valve flap part 17 is considered to be sealed in terms of tightness specifications, i.e. in terms of actual use, an air mass flow of 2 to 6 kg/h is permitted at the gap between the valve flap part 17 and the inner wall of the gas passage 13, which is considered to be "tight" in terms of tightness specifications depending on the diameter of the gas passage 13 in the premolded housing part 10. Alternatively, the valve flap part 17, which is preferably embodied with a domed flap surface and is injection molded into the premolded housing part, can also be embodied as a valve flap part 17 that does not pass through, which usually reaches its tightest position in the gas passage 13 at an inclined position between 8° and 10° in relation to a perpendicular 90° position of the valve flap part 17 in the gas passage. Even with valve flap parts 17 that do not pass through, in the "tight position" of the valve flap part 17 that pivots in the premolded housing part 10, an air mass flow of 2 kg/h to 6 kg/h is permitted between the sealing edge 23 and the inner wall of the gas passage 13. A throttle valve that does not pass through and is embodied in this way is considered to be "tight" in terms of the tightness specifications. Depending on the diameter dimensions of the gas passage 13 in the premolded housing part 10, it is also possible for there to be permissible air mass flows greater than the 2 kg/h to 6 kg/h indicated above; the throttle valve unit is still considered to be "tight" in terms of the tightness specifications, even with the increased air mass flows bypassing the sealing edge 23.

Page 15, please replace paragraph [0039] with the following amended paragraph:

[0039] The second injection molding station 40 according to Fig. 4 contains the second cavity 42, which is defined by the opposing end surfaces of a first mold insert 43 and a second mold insert 44. On the side of the first mold insert 43 delimiting the second cavity 42, a contour 47 is provided; in addition, the **injection point or** gate 24 is situated on the side of the first mold insert 43 oriented toward the second cavity 42. It is clear from Fig. 4 that the contour 47 of the first mold insert 43 serves to mold the ribbing 21 embodied on the back of the flap surface 18. The ribbing 21 and the contour of the flap surface are designed in accordance with the mechanical and flow engineering requirements in the throttle valve unit to be manufactured. In addition to the flap surface 18 of the valve flap part 17 being domed, it can also be embodied as flat.

Please replace paragraph [0041] with the following amended paragraph:

[0041] The premolded part 41 inserted into the second injection molding station 40 in Fig. 4 has an inner wall labeled with the reference numeral 53 [[with]] and is embodied with the wall thickness 16. The outer wall of the premolded part 41 is labeled with the reference numeral 54.

Page 16, please replace paragraph [0042] with the following amended paragraph:

[0042] In the method proposed according to the present invention, before the premolded part 41 is inserted into the second injection molding station 40, an intermediate treatment of the premolded part 41 can take place ~~between~~ **after** the first injection molding step, i.e. after the removal from the first molding station and before insertion of the premolded part 41 into the

second injection molding station 40 in Fig. 4. After the housing part 10, 41 is removed from the first cavity, i.e. after the first injection molding step is completed, the premolded part 41 is immediately given a thermal intermediate treatment above the glass temperature of the first plastic material. This can occur, for example, inside [[a]] **an annealing chamber or** warming cabinet. At the temperature level at which the intermediate treatment is performed, stresses induced in the thermoplastic during injection molding taper off. This is true not only for partially crystalline thermoplastics but also for amorphous high-temperature thermoplastics. After the premolded part 41 has been subjected to a few minutes of intermediate treatment, stresses and shrinkage effects, which have been induced in the thermoplastics by molecular orientations in the filling process of the first cavity and by delayed crystallization effects in the rapid cooling of the premolded part 41, **are relieved or** taper off to a negligible residual level. Without the execution of an intermediate treatment, the stresses, which have been induced in the partially crystalline thermoplastics by molecular orientations and by delayed crystallization effects in the rapid cooling of the premolded part 41, remain inherent in the premolded part 41 during its subsequent service life. The thermal intermediate treatment prevents the induced stresses from leading to a possible recovery deformation of the premolded part 41 and therefore to a change in the gap geometries during an extended operating time of the throttle valve unit. The change in the gap geometries due to recovery deformations of the housing 10, i.e. the premolded part 41, without thermal intermediate treatment would in the extreme case lead to possible seizing of a valve flap part 17 that moves in relation to the premolded part 41[[,]] ~~i.e. the housing part 10~~.

Page 19, please replace paragraph [0046] with the following amended paragraph:

[0046] Figs. 5.1, 5.2 show the second cavity, which is completely filled with the second plastic material; in the embodiment variant according to Fig. 5.1, ~~and~~ **an** insert sleeve has been inserted into the premolded part and in the embodiment variant shown in Fig. 5.2, the valve flap part is injection molded directly into the wall of the premolded part.

Please replace paragraph [0048] with the following amended paragraph:

[0048] The flap shaft parts 19 and 20 pass through the inner wall of the premolded part 41, which represents the housing part 10. The inner wall of the premolded part 41 is labeled with the reference numeral 53 and its outer wall is labeled with the reference numeral 54. Inner surfaces oriented toward one another at the flap shaft parts 19 and 20 and constituting the wall of the premolded part 41 are produced in accordance with the shape of the delimiting surfaces of the first mold insert 43 and second mold insert 44, which surfaces are oriented toward each other and now ~~constitute~~ **define** the second cavity 42 filled with the second plastic material 57. Adjacent to the first sealing surface 55 in the axial direction, before the second injection molding step, slide bushes 52 (see Fig. 5.1) can be slid or press-fitted onto the flap shaft parts 19 and 20 through the openings 14 for the flap shafts provided in the premolded part [[51]] **41**. When the second plastic material 57 is injected via the injection point 24, these slide bushes are filled by the second plastic material and are consequently accommodated in a precisely fitting fashion on the first flap shaft part 19 and the second flap shaft part 20. The slide bush labeled with the reference numeral 52 is comprised of a third material with friction-reducing and wear-reducing properties and extends in the axial length of the respective flap shaft part 19, 20. In the depiction in Fig. 5.2, the flap shaft part 20 is

injection molded directly into the wall of the premolded part 41 without the interposition of an insert sleeve of the kind shown in Fig. 5.1. This applies analogously to the first flap shaft part 19.

Page 25, please replace paragraph [0061] with the following amended paragraph:

[0061] A press-fitted insertion of the slide bushes 70, 71 and of the slide bush 52 in Fig. 5.1 into the wall of the premolded housing part 10 delimiting the gas passage 13 prevents the slide bushes 70, 71**, 52** from rotating. In this case, the flap shaft parts 19 and 20 are manufactured so that they are able to rotate in relation to the rotationally fixed slide bushes 70, 71 that have been inserted into the premolded housing part 10. Alternatively, the slide bushes 70, 71 can be injection molded into the wall of the premolded housing part 10 in a rotatable fashion; in this case, the flap shaft parts 19 and 20 of the valve flap part 17 are reverse injection molded into the slide bushes 70 and 71 in a rotationally fixed manner.

Please replace paragraph [0063] with the following amended paragraph:

[0063] It is clear from Fig. 10 that on the underside of the flap surface 18 of the valve flap part 17, a for example star-shaped ribbing 21 is produced by the **injection point or** gate 24. The hollow chambers inside the first flap shaft part 19 and second flap shaft part 20 are clearly visible due to the removal of the horizontally removable first and second core parts 45 and 46. The drawing also shows the first slide bush 70 and second slide bush 71 on the first flap shaft part 19 and the second flap shaft part 20, which slide bushes 70, 71 have been press-fitted or inserted into the openings 14 in the wall of the gas passage 13 before the

injection molding of the valve flap part 17 of the second plastic material 57 in the second cavity 42 of the second injection molding station 40.

Page 26, please replace paragraph [0065] with the following amended paragraph:

[0065] The slide bush labeled with the reference numeral 52 can be inserted into the wall of the premolded part 41 so that the wall accommodates the slide bushes 51, 52 in a rotationally fixed manner. The slide bushes 52 molded in a rotationally fixed manner by the flap shaft parts 19 and 20 of the valve flap part 17 permit the valve flap part 17 embodied with a domed flap surface 18 to rotate; on the other hand, the slide bush 52 can also be designed so that the [[flat]] **flap** shaft parts 19 and 20 in the depiction according to Fig. 5.1 of the flap ~~shaft~~ part 17, are molded in a rotationally fixed manner in the slide bush 52. In this case, the slide bush 52 is introduced into the wall of the premolded part 41 in such a way that the slide bush 52 can still rotate in relation to the premolded housing part 10 ~~(premolded part 41)~~. Although Fig. 5.1 shows only half of the valve flap part 17, whose flap shaft part 19 is encompassed by a slide bush 52, the flap shaft [[part]] **parts** 17 at both ends can accommodate insert sleeves contained in the premolded part 41. Likewise, as shown in Fig. 5.2, both flap shaft parts 19 and 20 can also be accommodated directly in the premolded part 41, without the interposition of slide bushes 52.

Page 27, please replace paragraph [0066] with the following amended paragraph:

[0066] In another advantageous embodiment of the method proposed according to the present invention, in order to influence or to be better able to adjust the gap geometries 61

and 62 between the inner wall 53 of the premolded part 41 and the sealing edge 23 of the valve flap part 17, the injection points 24 and 15, which represent the injection points for the plastic materials, can be specifically positioned at the cavities for the components 10, 41 and 17, 51 to be formed. The molten plastics for filling the cavities enter the first injection molding station and the second injection molding station 40 via the injection points 15 and 24, which represent the filling points of the first and second cavity, respectively. Depending on the geometrical position of the injection points 15, 24 in relation to one another, the orientation of the chain molecules in the plastic materials, and the reinforcing materials and fillers they contain, it is possible to use the flow orientation of the molten plastics to influence the shrinkage behavior of the resulting premolded part 41 and of the valve flap part 17 so that during the cooling phase that follows the injection molding process, the throttle valve unit, i.e. the two-component injection molded part 60, the desired gap dimensions 61, 62 **develop** between the bearing points of the valve flap part 17 – whether of the pass-through or non-pass-through embodiment – and the slide bushes 52, 70, 71, **and** the required gap dimension of a few μm is produced between the sealing edge 23 of the inner wall 53 of the gas passage 13. The gap dimension between the inner wall 53 of the gas passage 13 of the premolded part 41 and the sealing edge 23 of the valve flap part 17 remains as constant as possible during operation of the throttle valve unit manufactured according to the present invention, even with extreme temperature variations, and experiences no changes that negatively influence the air mass flow that occurs in the sealed position of the valve flap part 17 – whether of the pass-through or non-pass-through embodiment – and the inner wall 53 of the gas passage 13.

Page 28, please replace paragraph [0067] with the following amended paragraph:

[0067] In the plastic materials currently used for the premolded part 41, which represents the housing part 10, and for the valve flap part 17, it is possible for these plastic materials to contain high reinforcing fiber contents. Because of the high reinforcing fiber content, which reduces geometrical changes in the fiber direction on reorientation of the polymer chains and reduces expansion coefficients in the fiber direction, in order to achieve a high degree of geometrical stability of the finished injection molded [[part]] **unit** 60 with regard to gap dimensions 61, 62 of the premolded part 41, **the housing** can be injection molded centrally in the middle via several punctiform injection points 15 on the circumference of the wall that the limits the gas passage 13, close to the valve flap plane the valve flap part 17 itself. In the region of the flap shaft parts 19, 20 injection molded into the premolded part 41, the fiber directions in the flap shaft parts 19 and 20 are oriented parallel to the axis of the valve flap part 17, which results in a shrinkage behavior that causes similar shrinkages to occur in the premolded part 41 and in the valve flap part that is molded inside it.

Please replace paragraph [0068] with the following amended paragraph:

[0068] Using the two-component injection molding method proposed according to the present invention in spatially separate cavities in two sequentially operated injection molding stations makes it possible by ~~means of the method proposed according to the present invention~~ to manufacture throttle valve units with a high degree of precision in which finishing work is negligible, the rejection rates of premolded parts 41 are drastically reduced, and the gap geometries 61 and 62 achieved are assured of remaining unchanged over the

service life of the air conveying device thanks to the early reduction of internal stresses that would have led to deformations.

Page 29, please replace paragraph [0069] with the following amended paragraph:

[0069] According to another, final embodiment variant of the method proposed according to the present invention for manufacturing a throttle valve unit, when there are impermissibly large gap dimensions 61, 62 between the sealing edge 23 of the valve flap part [[13]] **17** and the inner wall 53 of the gas passage 13 and between the insert sleeves or slide bush gaps, an additional, fourth material can be introduced into the two-component injection molded part 60. This additional, fourth material can serve to form a lubricating layer between the valve flap ~~parts~~ **part** 17 and the inner wall 53 of the gas passage 13 that ~~they move~~ **it moves** in relation to; between the flap shaft parts 19 and [[29]] **20** and the slide bushes 52, 70, and 71; and between the slide bushes 52, 70, 71 and the openings in the premolded housing part 10. If this fourth material is completely or partially removed, then the gap dimensions 61, 62 in the two-component injection molded part 60 that previously lay outside the tightness specifications can now lie within the tightness specifications of the throttle valve unit. Analogous to that which has been mentioned above, the tightness specifications for throttle valve units can depend on the diameter of the gas passage 13 in the premolded housing part 10, which represents the premolded part 41. A throttle valve unit that meets the tightness specifications is considered to be "tight" in terms of tightness specifications if the air mass flow passing through the gaps between the sealing edge 23 and the inner wall 53 of the premolded part 10 or the gap geometries 61, 62 lies within a range from 2 kg/h to 6 kg/h.

Please add the following new paragraph after paragraph [0069]:

[0070] The foregoing relates to preferred exemplary embodiment of the invention, it being understood that other variants and embodiments thereof are possible within the spirit and scope of the invention, the latter being defined by the appended claims.

Please delete pages 30 and 31.